Original Article

MEDICINE PALLIATIVE CARE

DOI: 10.47582/jompac. 1510500

J Med Palliat Care. 2024;5(4):198-202

Assessment of depression and anxiety and their relationship with functional status in patients with stroke

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Cite this article as:Başaran PÖ, Aykaç S. Assessment of depression and anxiety and their relationship with functional status in patients with stroke. *J Med Palliat Care*. 2024;5(4):198-202.

Received: 04.07.2024 ◆ **Accepted**: 16.08.2024 ◆ **Published**: 29.08.2024

Aims: This study aimed to investigate the anxiety and depression levels and the relationship between functional status and depression, anxiety, pain, and quality of life in stroke patients.

Methods: 65 stroke patients and 65 healthy controls were involved in the study. After recording the sociodemographic characteristics of all patients, anxiety, and depression levels were evaluated with the hospital anxiety depression (HAD) scale, and the quality of life with the Nottingham Health Profile (NHP) questionnaire. In stroke patients, functional status was evaluated with the functional ambulation categories (FAC), disease stages with the Brannstrom Staging system, and pain intensity with the visual analogue scale (VAS).

Results: Anxiety levels were high in 33 patients (50.77%) in the stroke group and 16 patients (24.60%) in the control group. Depression levels were high in 35 patients (53.85%) in the stroke group and 25 patients (38,46%) in the control group. In the stroke group, the HAD anxiety, HAD depression, and HAD total scores of patients were statistically significantly higher compared to the control group (p:0.036, p:0.013, p: 0.010,respectively). When the quality of life of the patients was examined, the NHP energy level was statistically significantly lower in the stroke group (p:0.008). Examination of the stroke patients by their functional ambulation levels revealed statistically lower HAD anxiety, HAD depression, and HAD total scores with higher functional status (p:0.003, p: <0,001, p: <0,001, respectively). NHP pain, sleep, physical mobility, energy, distress subdomains, and NHP total scores were statistically significantly different with the functional status of patients. Negative correlations were found between FAC scores with pain, HAD anxiety, HAD depression, HAD total, and NHP total scores.

Conclusion: Anxiety and depression levels are higher in stroke patients. And also there is an inverse relationship between functional status and the severity of pain, anxiety, depression, and quality of life.

Keywords: Anxiety, depression, functional status, quality of life, stroke

INTRODUCTION

Strokes occur due to either a cerebral infarction or a cerebral hemorrhage and constitute the major cause of permanent disability. Stroke is a leading cause of mortality after heart disease and cancer. Stroke patients face not only physical disability but also psychosocial problems that will unfavorably act on physical rehabilitation and recovery processes.[1] Depression and anxiety are among the most common psychiatric disorders following a stroke. Patients with post-stroke anxiety disorder often suffer from comorbid depression. Depression can occur in 20-60% of stroke patients.[2] Although post-stroke depression is common, not all patients receive adequate diagnosis and treatment. Failure to differentiate depressive findings from cognitive impairment due to ischemic brain damage in post-stroke patients complicates diagnosis.[3] The rates of depression in the first three years following a stroke vary between 14% and 30%. The risk of developing depression is highest during the first year after a stroke. However, depression can occur at any time in a stroke patient.[4] The mechanism of developing post-stroke depression is not fully known, but various biological factors such as disruption of the hypothalamic and adrenal axis or changes in cortisol and interleukin 6 levels are suggested to play a major role. Magnetic resonance images of patients with post-stroke depression reveal white matter lesions and lacunar infarcts as the primary pathological culprits. The likelihood of suicide or a new ischemic event is high in patients suffering from post-stroke depression, contributing further to increased stroke-related mortality.[5] Moreover, early diagnosis and treatment of post-stroke depression is important for an effective rehabilitation process.

Anxiety can be defined as a state of unsubstantiated worry and fear accompanied by somatic symptoms. Generalized anxiety disorder is defined as a condition characterized by excessive worrying and anxiousness, which are difficult to control. These should occur in more than one day during at least six months. The condition causes severe distress and impairs daily activities of living.[6] Post-stroke anxiety is common and occurs in one out of three stroke patients. Patients develop anxiety due to the fear of having another stroke and because of worries

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about restoration of function and fall-related accidents.[7,8] However, anxiety acts on the physical rehabilitation process and quality of life untowardly. Therefore, adequate diagnosis and treatment are important.

Pain is common after a stroke, unfavorably affecting the quality of life and the functional status in daily life. However, pain is often not inquired actively and is overlooked. Post-stroke pain leads to a delayed recovery process, impairs the quality of life, and causes psychosocial problems in stroke patients. Pain affects the rehabilitation process adversely. Post-stroke pain can present as central pain, complex regional pain syndrome, shoulder pain, spasticity-related pain, or a headache. The pathophysiology of these subtypes awaits to be established and post-stroke pain is usually resistant to treatment.[9]

Depression, anxiety, and pain following a stroke are common medical conditions, and adequate diagnosis and treatment favorably affect recovery, rehabilitation, and the restoration of daily function. Thus, to avoid overlooking the appropriate diagnosis, it may be prudent to screen these clinical conditions with relevant screening scales before patients present with distress and symptoms. This study aimed to investigate the relationship between functional status and depression, anxiety, pain, and quality of life in stroke patients.

METHODS

This study was approved by the Clinical Researches Ethics Committee of the Hitit University Faculty of Medicine (Date: 28.09.2023, Decision No: 118) and written informed consent was obtained from each participant and written informed consent was obtained from each participant. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The study with a controlled and prospective design included 65 stroke patients, who were admitted to the neurology outpatient clinic with a diagnosis of a stroke during the period between September 2023 and May 2024. For the control group with a similar age and gender distribution to that of the patient group, the study included 65 healthy subjects, who were admitted to the neurology outpatient clinic during the same period for routine check-ups and diagnosed with no neurological disease.

Patients older than 18 years of age, who passed the acute phase of a stroke diagnosed as with the World Health Organization criteria by an experienced neurologist, were included in the study. Patients and the healthy control subjects having a condition that might involve the central nervous system, having a severe cardiovascular disease such as heart failure, arrhythmia, or myocardial infarction that would affect the functional status, having a psychiatric disorder, Alzheimer's disease, dementia, or a condition that would cause cognitive dysfunction, having severe visual or hearing impairment that would interfere with proper communication with the patient, having a malignant disease, having joint contractures or amputation that would impair the functional status, or pregnant or breastfeeding women were excluded. After recording the socio-demographic characteristics and physical examination findings of all patients, patients' anxiety and depression levels were assessed with the hospital anxiety depression (HAD) scale questionnaire. The HAD scale questionnaire consists of 14 items and is filled out by patients. The scale includes two subscales, which assess depression and anxiety. The cut-off scores for the Turkish version of the HAD scale were found to be 10 for the anxiety subscale and 7 for the depression subscale. The validity and reliability of the Turkish version of the HAD scale were studied previously.[10]

In stroke patients, functional status was evaluated with the functional ambulation categories (FAC), disease stages with the Brunnstrom staging system, the quality of life with the nottingham Health Profile (NHP) questionnaire, and the pain intensity with the visual analogue scale (VAS).

The Brunnstrom Staging system is one of the tests to evaluate the restoration of the motor control ability of the body following a stroke. Synergistic movement patterns occurring during the recovery process are evaluated for the assessment. The upper extremity, the hand, and the lower extremity findings are scored on a scale from 1 to 6. Higher scores indicate closer to normal functioning.[11]

FAC is a classification system consisting of 6 categories from 0 to 5, aiming to grade the ambulation ability of patients by evaluating the dependence on personal support during the ambulation process. FAC category 0 refers to nonfunctional ambulation, indicating that the ambulatory and non-dependent patient, who can walk freely on any surface, including stairs.[12]

The health-related quality of life was assessed by using the Turkish version of the NHP questionnaire. NHP consists of the subdomains of physical mobility (pm), pain (p), sleep (sl), emotional reaction (em), social isolation (so), energy (en), and distress (d). Each subdomain is scored from 0 to 100. Higher scores indicate more severe health problems.[13]

The pain severity was assessed with VAS, patients marked the average pain severity they felt in the last week along a 10-centimeter scale. A zero score indicated "no pain", while a score of 10 indicated pain severity of "as bad as it could be".[14] According to the previous study, the power analysis performed with the G* Power program (Power=0.80; α=0.05; d (effect size)=0.70) based on the anxiety and depression scores obtained from the study, the sample size was calculated as 110 patients.[15]

Statistical Analysis

The statistics of the study were performed using IBM SPSS statistics 23.0 program. Descriptive statistics were expressed as mean±standard deviation if the numerical variables fit the normal distribution, median and minimum-maximum value if they do not fit the normal distribution, and number and percentage for categorical variables. Comparisons between groups were made by t-test or Mann-Whitney U test for numerical variables and chi-square test for categorical variables according to normal distribution. Pearson correlation test was used for correlation analysis between FAS score and VAS, NHP, anxiety, depression, and total HAD scores. $p<0.05$ was considered statistically significant.

RESULTS

65 healthy subjects and 65 stroke patients were included in the study. The distribution of age, marital status, smoking, alcohol use, or having a computer, internet, or smartphone at home was not different between the groups. However, the working status and the education level of the patients were statistically significantly different between the groups, the rate of primary school graduates and non-workers was higher in the patient group (Table 1).

Table 1. Demographic characteristics of patient and control groups

	Patient (n=65)	Control (n=65)	p
Age	60 (53-68)	61 (55-70)	0.302
Sex (female)	31 (47.7%)	32 (49.2%)	0.849
Educational Status			
0-8 year 9-12 year >12 year	40 (61.5%) 13 (20%) 12 (18.5%)	34 (52.3%) 6 (9.2%) 25 (38.5%)	0.038
Marital Status			
Married Single	53 (81.5%) 12 (18.5%)	55 (84.6%) 10 (15.4%)	0.801
Working Status			
Worker Nonworker	8 (12.3%) 57 (87.7%)	23 (35.4%) 42 (64.6%)	0.004
Smoke status			
Smoker Nonsmoker Ex-smoker	15 (23.1%) 35 (61.5%) 10 (15.4%)	21 (32.3%) 37 (56.9%) 7 (10.8%)	0.408
Alcohol user	5 (7.7%)	6 (9.2%)	0.751
Presence of comorbid diseases	52 (80%)	20 (30.7%)	<0.001
Computer presence at home	23 (35.4%)	22 (33.8%)	0.842
Smartphone presence	42 (64.6%)	47 (72.3%)	0.409
Internet presence	36 (55.4%)	35 (53.8%)	0.600

%: Column percent, p values in bold indicate statistically significant.

Anxiety levels were high in 33 patients (50.77%) in the stroke group and 16 patients (24.60%) in the control group. Depression levels were high in 35 patients (53.85%) in the stroke group and 25 patients (38.46%) in the control group. In the stroke group, the HAD anxiety, HAD depression, and HAD total scores of patients were statistically significantly higher compared to the control group (p:0.036, p:0.013, p: 0.010, respectively). When the quality of life of the patients was examined, the NHP energy level was statistically significantly lower in the stroke group (p:0.008), but other subdomain scores of NHP were similar between the groups (Table 2). Examination of the stroke patients by their functional ambulation levels revealed statistically lower HAD anxiety, HAD depression, and HAD total scores with higher functional status (p:0.003, p: <0.001, p: <0.001, respectively). NHP pain, sleep, physical mobility, energy, distress subdomains, and NHP total scores were statistically significantly different with the functional status of patients (Table 3). As seen in (Table 4), negative correlations were found between FAC scores with pain, HAD anxiety, HAD depression, HAD total, and NHP total scores. No correlations found with VAS and HAD anxiety, HAD depression and HAD total scores (p:0.150, p:0.174, p:0.175, respectively).

Table 2. Comparisions of the groups

	Patient(n=65)	Control(n=65)	p
HAD anxiety	9 (5-12)	7 (4-10)	0.036
HAD depression	10 (6-13)	7 (5-11)	0.013
HAD total	18.16 ± 8.06	14.63 ± 5.78	0.010
NHP pain	20.18 (5.83-56.68)	35.27 (5.83-65.38)	0.507
NHP emotional reaction	31.50 (9.31-79.25)	17.55 (0-62.3)	0.388
NHP sleep	38.47 (0-77.63)	12.57 (0-43.36)	0.221
NHP social isolation	22.01 (0-44.54)	23.58 (0-41.37)	0.419
NHP physical mobility	36.5 (10.79-36.5)	31.63 (0-59.83)	0.288
NHP energy	63.2 (24-100)	24 (0-100)	0.008
NHP distress	30.50 (9.11-76.55)	21.57 (0-68.3)	0.358
NHP total	222 (106-409)	189 (52.87-292.47)	0.195

Numerical data are given as mean±standard deviation or median (interquartile range) values. p values in bold indicate statistically significant. HAD: Hospital anxiety depression scale NHP: Nottingham health profile (NHP) questionnaire

Table 3. Comparision between functional disability levels with depression and quality of life scores

	FAS 3 (n=21)	FAS 4 (n=20)	FAS 5(n=24)	p
Brunnstrom				
Upper extremity	4 (1.75-5)	5 (4-5)	6 (5-7)	
Hand	3.5 (1.75-5)	5 (4-5)	6 (5-6)	<0.001
Upper extremity	3 (3-4)	5 (4.5-5)	6 (5-6)	
VAS	5.5 (4-7.25)	4 (3-5)	3.5 (2-5)	0.099
HAD anxiety	12.5 (5.6-15)	8 (4-10)	8 (3.25-11)	0.003
HAD depression	13 (10-15)	8 (5.5-12)	7.5 (4-10.75)	<0.001
HAD total	24.66 ± 5.95	15.55±6.57	14.5 ± 7.51	<0.001
NHP pain	54.15 (24.54-87.09)	17.05 (7.39-43.41)	7.39 (0-24.71)	0.002
NHP emotional reaction	82.63 (27.12-100)	17.54 (10.47-53.36)	14.01 (0-38.85)	0.003
NHP sleep	77.63 (38.47-77.63)	12.57 (0-77.96)	16.77 (0- 36.06)	0.001
NHP social isolation	40.1 (0- 88.02)	22.01 (0- 31.01)	16.39 (0- 22.4)	0.096
NHP physical mobility	72.52 (44.72-88.46)	32.56 (5.28-54.55)	11.2 (0- 28.93)	<0.001
NHP energy	100 (100- 100)	63.2 (12- 100)	38 (0- 90.75)	0.001
NHP distress	30.50 (9.11-76.55)	21.57 (5.1-68.4)	11.28 (0-45.2)	0.003
NHP total	449.32 (249.75- 483.93)	218.57 (106.07- 319.94)	113.43 (36.95- 225.61)	<0.001

Numerical data are given as mean±standard deviation or median (interquartile range) values. *p* values in bold indicate statistically significant. VAS: Visual analog scale, HAD: Hospital anxiety depression scale NHP: Nottingham health profile (NHP) questionnaire

Table 4. Correlation between functional status and clinical features of stroke patients

		VAS	HAD Anksiyete	HAD Depresyon	HAD Total	NHP
FAS	Pearson Correlation	-.305*	-.407**	-.564**	-.522**	-.598**
	Sig. (2-tailed)	.024	.002	.000	.000	.000

r: Pearson correlation *. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed). VAS: Visual anolog scale, HAD: Hospital anxiety depression scale NHP: Nottingham health profile (NHP) questionnaire

DISCUSSION

Stroke is a debilitating condition that not only impairs physical health but also acts profoundly on mental well-being. Beyond the immediate physical consequences, individuals who have experienced a stroke, often grapple with emotional challenges, including anxiety and depression. This study aimed to investigate the complex relationship between depression, anxiety, pain, and functional status in stroke patients. We found that anxiety and depression levels were higher in stroke patients and that functional capacity was inversely related to pain, anxiety, depression, and quality of life.

The most common mental health symptoms in post-stroke patients are anxiety and depression. Post-stroke depression is one of the most important factors that may affect mental health.[16] Anxiety or depression is a serious but treatable condition; therefore, it is important to screen the entire population at risk. In our study, we evaluated anxiety and depression levels with HADS in stroke patients. A study conducted on 1443 patients in London previously reported that HADS gave accurate and reliable results about the severity of anxiety and depression.[17] A study conducted on stroke patients in Australia reported the median HAD anxiety and depression scores as 6 and 5, respectively.[18] That study included patients with a stroke and TIA but excluded patients, who were in their first three months following a stroke. In our study, HAD anxiety and depression scores were 9 and 10, respectively. The poorer functional status of the patients in our study may explain these higher scores compared to the abovementioned results in the literature. The frequencies of anxiety and depression in stroke patients have been evaluated in various studies in the literature. In our study, anxiety and depression levels were high in half of the stroke patients (50.77% and 53,85%). A review study reported that the frequency of anxiety in stroke patients ranged from 4.8 to 63.6%.[19] Another review study reported that the frequency of depression in stroke patients was in the range of 11-41%.[20] Although the reported rates vary across the studies in the literature, all studies show an increased frequency of anxiety in stroke patients.

An in-depth analysis of the impact of anxiety and depression on the functional status of the patient sheds light on the interconnectedness of these variables. Emotional distress may appear as reduced motivation, impeding rehabilitation efforts and delaying the overall recovery process. On the other hand, improvements in functional status have the potential to act on mental health favorably, highlighting the symbiotic relationship between physical and emotional well-being. A Chinese study found an inverse relationship between physical function and depression severity.[21] Astuti et al.[22] showed decreased depression severity with increased functional ability of the patient. Similar to these studies, we found an inverse relationship between the functional status of the patients and their anxiety and depression severity. Stroke patients with low levels of functional ability have an increased likelihood of developing anxiety and depression, impeding the treatment success and leading to permanent disability. This suggests that a thorough examination for anxiety and depression will increase the success of treatment in a stroke patient, who has a low level of functional ability.

Stroke survivors often experience pain,[23] either directly related to the stroke or as a consequence of altered movement patterns. Research indicates a bidirectional relationship between depression, anxiety, and pain.[24] A relationship between pain and the development of depression and anxiety is likely and the emotional distress associated with these conditions may exacerbate the perception of pain. We attempted to demonstrate this relationship in our study. Despite the availability of several scales to assess pain, there is no specific method for pain assessment in stroke patients. Therefore, we evaluated pain severity with VAS in our study. However, we did not find a relationship between pain and anxiety or depression levels. A study conducted in Sweden reported an association between pain and depression severity, but patients were evaluated in the 16th month after a stroke.[25] Another study conducted in Denmark reported a relationship between pain and depression, but that study included chronic stroke patients with an average duration of the condition of 794 days.[26] In our study, we evaluated patients not later than in the 12th month after a stroke. Similar to our findings, Şahin et al.[27] reported that, in stroke patients, there was no relationship between pain and functional outcomes or between pain and depression and mental scores. Furthermore, a review study conducted to examine the relationship between pain and depression in stroke patients reported inconclusive findings and the authors concluded that this subject matter needed to be examined more comprehensively.[28] This study adds to the growing body of literature by providing robust evidence of the intricate relationship between functional status and emotional well-being in stroke patients. The novel contribution of this study lies in its simultaneous examination of anxiety, depression, pain, and quality of life in a single cohort of stroke patients. This holistic approach highlights the multifaceted challenges faced by stroke survivors, emphasizing the need for integrated care strategies that address both physical and psychological aspects of recovery. The findings underscore the importance of considering emotional health as a critical component of stroke rehabilitation, particularly in patients with lower functional status.

Limitations

Because of the cross-sectional design of our study, we were able to evaluate the anxiety and depression severity only at the time of examination of the patients. We used a self-assessment scale to assess the anxiety and depression levels of the patients in our study.

CONCLUSION

Depression and anxiety commonly develop in stroke patients. In this study, there is an inverse relationship between functional status and the severity of pain, anxiety, depression, and quality of life. Therefore, stroke patients with functional limitations need to be examined thoroughly for early management of anxiety and depression. The recognition and

management of both the emotional and physical aspects of stroke recovery will help healthcare professionals contribute to a holistic and effective rehabilitation process for their patients. While this study has made significant strides in understanding the relationship between functional status and emotional well-being in stroke patients, further research is needed to explore these dynamics over longer follow-up periods and across different patient populations. Future studies could focus on longitudinal analyses to track changes in anxiety, depression, and functional status over time, providing deeper insights into the long-term effects of integrated rehabilitation strategies.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was approved by the Clinical Researches Ethics Committee of the Hitit University Faculty of Medicine(Date: 28.09.2023, Decision No: 118) and written informed consent was obtained from each participant.

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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